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NOTICE OF ALLOWANCE AND FEE(S) DUE

7590 03/28/2006

BAOJIA HUANG
6100 WOODLAKE DR. NE, APT#102
PALM BAY, FL 32905

EXAMINER	
GIBSON, ERIC M	
ART UNIT	PAPER NUMBER
3661	

DATE MAILED: 03/28/2006

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/613,885	07/03/2003	Baojia Huang	AWG 001	6866

TITLE OF INVENTION: VEHICLE COLLISION AVOIDANCE SYSTEM AND METHOD

APPLN. TYPE	SMALL ENTITY	ISSUE FEE	PUBLICATION FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	YES	$700	$0	$700	06/28/2006

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE REFLECTS A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE APPLIED IN THIS APPLICATION. THE PTOL-85B (OR AN EQUIVALENT) MUST BE RETURNED WITHIN THIS PERIOD EVEN IF NO FEE IS DUE OR THE APPLICATION WILL BE REGARDED AS ABANDONED.

HOW TO REPLY TO THIS NOTICE:

I. Review the SMALL ENTITY status shown above.

If the SMALL ENTITY is shown as YES, verify your current SMALL ENTITY status:

A. If the status is the same, pay the TOTAL FEE(S) DUE shown above.

B. If the status above is to be removed, check box 5b on Part B - Fee(s) Transmittal and pay the PUBLICATION FEE (if required) and twice the amount of the ISSUE FEE shown above, or

If the SMALL ENTITY is shown as NO:

A. Pay TOTAL FEE(S) DUE shown above, or

B. If applicant claimed SMALL ENTITY status before, or is now claiming SMALL ENTITY status, check box 5a on Part B - Fee(s) Transmittal and pay the PUBLICATION FEE (if required) and 1/2 the ISSUE FEE shown above.

II. PART B - FEE(S) TRANSMITTAL should be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). Even if the fee(s) have already been paid, Part B - Fee(s) Transmittal should be completed and returned. If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Utility patents issuing on applications filed on or after Dec. 12, 1980 may require payment of maintenance fees. It is patentee's responsibility to ensure timely payment of maintenance fees when due.

PTOL-85 (Rev. 01/06) Approved for use through 04/30/2007.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: Mail **Mail Stop ISSUE FEE**
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BAOJIA HUANG
6100 WOODLAKE DR. NE, APT#102
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(Signature)

(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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nonprovisional	YES	$700	$0	$700	06/28/2006

EXAMINER	ART UNIT	CLASS-SUBCLASS
GIBSON, ERIC M	3661	701-301000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.

☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list

(1) the names of up to 3 registered patent attorneys or agents OR, alternatively,

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3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE (B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ☐ Individual ☐ Corporation or other private group entity ☐ Government

4a. The following fee(s) are enclosed:

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4b. Payment of Fee(s):

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☐ Payment by credit card. Form PTO-2038 is attached.

☐ The Director is hereby authorized by charge the required fee(s), or credit any overpayment, to Deposit Account Number _____ (enclose an extra copy of this form).

5. **Change in Entity Status** (from status indicated above)

☐ a. Applicant claims SMALL ENTITY status. See 37 CFR 1.27.

☐ b. Applicant is no longer claiming SMALL ENTITY status. See 37 CFR 1.27(g)(2).

The Director of the USPTO is requested to apply the Issue Fee and Publication Fee (if any) or to re-apply any previously paid issue fee to the application identified above. NOTE: The Issue Fee and Publication Fee (if required) will not be accepted from anyone other than the applicant; a registered attorney or agent; or the assignee or other party in interest as shown by the records of the United States Patent and Trademark Office.

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This collection of information is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.

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7590 03/28/2006

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EXAMINER	
GIBSON, ERIC M	
ART UNIT	PAPER NUMBER
3661	

DATE MAILED: 03/28/2006

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(application filed on or after May 29, 2000)

The Patent Term Adjustment to date is 0 day(s). If the issue fee is paid on the date that is three months after the mailing date of this notice and the patent issues on the Tuesday before the date that is 28 weeks (six and a half months) after the mailing date of this notice, the Patent Term Adjustment will be 0 day(s).

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (http://pair.uspto.gov).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

PTOL-85 (Rev. 01/06) Approved for use through 04/30/2007.

Notice of Allowability	Application No.	Applicant(s)	
	10/613,885	HUANG, BAOJIA	
	Examiner	Art Unit	
	Eric M. Gibson	3661	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *3/1/2006*.

2. ☒ The allowed claim(s) is/are *45-61*.

3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
   a) ☐ All b) ☐ Some* c) ☐ None of the:
      1. ☐ Certified copies of the priority documents have been received.
      2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
      3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
      1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
   (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO-1449 or PTO/SB/08), Paper No./Mail Date _____
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application (PTO-152)
6. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____ .
7. ☒ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____.

THOMAS G. BLACK
SUPERVISORY PATENT EXAMINER
GROUP 3600

EXAMINER'S AMENDMENT

An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

The application has been amended as follows:

Cancel claims 1-44 and replace with new claims 45- 61.

45. A vehicle collision avoidance system comprising:

a circumferentially rotating pulsed infrared laser beam scanner apparatus including a laser pulsed emitter and an infrared laser sensor for generating a first signal representative of an obstacle scanned, the laser pulsed emitter rotating circumferentially in a horizontal plane and a vertical plane simultaneously, the infrared laser sensor circumferentially rotating synchronously with the laser pulsed emitter in the horizontal plane and receiving a reflected laser beam signal from the obstacle scanned;

wherein the laser pulsed emitter is emitting a laser beam signal over a 360° field of view and the infrared laser sensor is receiving the reflected laser beam signal over the 360° field of view;

a processing circuit coupled to the circumferentially rotating pulsed infrared laser beam scanner apparatus for processing the first signal and generating a plurality of signals;

a processor coupled to the processing circuit for processing the plurality of signals and generating a braking signal; and

a braking apparatus responsive to the braking signal.

46. The vehicle collision avoidance system of claim 45, wherein the circumferentially rotating pulsed infrared laser beam scanner apparatus is operable to scan an object from 1.6m to 120m.

47. The vehicle collision avoidance system of claim 45, wherein the circumferentially rotating pulsed infrared laser beam scanner apparatus rotates in the horizontal plane at 48 revolutions per second and with a period of 20.83ms and in the vertical plane at 8 sectors per second and a period of 20.83ms.

48. The vehicle collision avoidance system of claim 45, wherein the circumferentially rotating pulsed infrared laser beam scanner apparatus emits a laser beam having 28.45W peak power, an average power of 142mW, a wavelength between 1μm and 1.550μm excluding the region between 1.3μm and 1.4μm, and preferably between 1.450μm and 1.550μm, a 1.0ns to 1.25ns pulse width, a 10Mhz to 110Mhz repetition rate, and a 0.002 radian emitting pulsed laser beam divergent angle.

49. A method of avoiding a vehicle collision comprising:

determining features of an obstacle using a circumferentially rotating pulsed infrared laser beam scanner apparatus including a laser pulsed emitter and an infrared laser sensor for generating a first signal representative of the obstacle scanned, the laser pulsed emitter rotating circumferentially in a horizontal plane and a vertical plane simultaneously, the infrared laser sensor circumferentially rotating synchronously with the laser pulsed emitter in the horizontal plane and receiving a reflected laser beam signal from the obstacle scanned;

wherein the laser pulsed emitter is emitting a laser beam signal over a 360° field of view and the infrared laser sensor is receiving the reflected laser beam signal over the 360° field of view;

processing signals representative of the determined features, and

braking the vehicle in the event the processed signals indicate an imminent collision.

50. The method of avoiding a vehicle collision of claim 49, wherein the circumferentially rotating pulsed infrared laser beam scanner apparatus emits a laser beam having 28.45W peak power, an average power of 142mW, a wavelength between 1μm and 1.550μm excluding the region between 1.3μm and 1.4μm, and preferably between 1.450μm and 1.550μm, a 1.0ns to 1.25ns pulse width, a 10Mhz to 110Mhz repetition rate, and a 0.002 radian emitting pulsed laser beam divergent angle.

51. A method of avoiding a vehicle collision comprising:

circumferentially detecting bodies proximate the vehicle using a circumferentially rotating pulsed infrared laser beam scanner apparatus including a laser pulsed emitter and an infrared laser sensor for generating a first signal representative of a body scanned, the laser pulsed emitter rotating circumferentially in a horizontal plane and a vertical plane simultaneously, the infrared laser sensor circumferentially rotating synchronously with the laser pulsed emitter in the horizontal plane and receiving a reflected laser beam signal from the body scanned;

wherein the laser pulsed emitter is emitting a laser beam signal over a 360° field of view and the infrared laser sensor is receiving the reflected laser beam signal over the 360° field of view;

obtaining data from the circumferentially rotating pulsed infrared laser beam scanner apparatus including a time when the beam reaches a first edge of each body and a time when the beam reaches a second edge of each body;

determining a relative distance from the scanner apparatus to each body;

determining a time to collision with each body; and

determining a braking force to avoid a collision with each body.

52. The method of avoiding a vehicle collision of claim 51, further comprising determining a critical point at which an absolute value of the derivative of each bodies acceleration with respect to time approaches zero.

53. The method of avoiding a vehicle collision of claim 52, wherein determining the relative distance and determining the time to collision are initiated at the critical point.

54. The method of avoiding a vehicle collision of claim 51, further comprising determining a relative angular velocity of each body.

55. The method of avoiding a vehicle collision of claim 51, wherein determining the time to collision comprises computing a second order factor.

56. The method of avoiding a vehicle collision of claim 51, further comprising determining the bumpiness of a road surface.

57. The method of avoiding a vehicle collision of claim 56, wherein determining the braking force to avoid a collision with each obstacle comprises determining a first braking force in a case where the time to collision is less than 1.5 seconds and a second braking force in a case where the road is bumpy.

58. The method of avoiding a vehicle collision of claim 51, wherein determining the time to collision further comprises determining vertical and horizontal components of each body.

59. The method of avoiding a vehicle collision of claim 51, further comprising determining a rate of approach of the vehicle and each body.

60. The method of avoiding a vehicle collision of claim 51, wherein the obtaining and determining steps are performed in a point-to-point vector processing manner.

61. The method of avoiding a vehicle collision of claim 51, further comprising using an analog circuit to process the time when the beam reaches the first edge of each body and the time when the beam reaches the second edge of each body, the relative distance from the scanner apparatus to each body, a relative angular velocity of each body, an acceleration of each body, and a derivative of the acceleration.

Reasons for Allowance

Claims 45-61 are allowed.

The following is an examiner's statement of reasons for allowance:

The Examiner and the Applicant discussed the invention and the prior art as described in the Interview Summary mailed on 7/29/2006. During the discussions, the Examiner and the Applicant were able to isolate the distinctive feature of the invention over the prior art. Specifically, the prior art does not teach or reasonably suggest in combination the use of a circumferentially rotating pulsed infrared laser beam scanner apparatus including a laser pulsed emitter and an infrared laser sensor for generating a

first signal representative of a body scanned, the laser pulsed emitter rotating circumferentially in a horizontal plane and a vertical plane simultaneously, the infrared laser sensor circumferentially rotating synchronously with the laser pulsed emitter in the horizontal plane and receiving a reflected laser beam signal from the body scanned, wherein the laser pulsed emitter is emitting a laser beam signal over a 360° field of view and the infrared laser sensor is receiving the reflected laser beam signal over the 360° field of view.

This allowable feature is included as a limitation incorporated into independent claims 45, 49, and 51. Claims 46-48, 50, and 52-61 serve to further define the invention over the prior art.

The Examiner's Amendment replacing the Applicant-submitted claims was necessary to properly incorporate the limitations as discussed with the Applicant on 7/29/2006, to clear up any remaining indefiniteness or other claim objections, and to provide a clean copy of the claims for entry.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Eric M. Gibson whose telephone number is (571) 272-6960. The examiner can normally be reached on M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Thomas Black can be reached on (571) 272-6956. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

EMG